Claims

1. A local network-capable device adapted for collaborative operation and communication over a network with at least one remote network-capable device, said local network-capable device comprising:

   A) a memory for storing a local copy of data in accordance with a data model;

   B) a data-change engine coupled with the memory, and responsive to a plurality of data change requests, for controlling storage of the local copy of data in the memory in accordance with the data model and making changes to the local copy of the data; the data change requests including a locally-generated data change request and a remotely-generated data change request; and

   C) a dynamics manager, coupled with the data-change engine, and responsive to the data change requests for controlling the engine and coordinating execution of the data change requests; wherein the dynamics manager, responsive to the data change requests, can cause the making of data changes, the rolling-back of data changes and the remaking of data changes.

2. The local network-capable device in accordance with claim 1, wherein the dynamics manager causes making, rolling-back and remaking of data changes in response to a data change request priority scheme.

3. The local network-capable device in accordance with claim 1, wherein the data change request priority scheme includes encoding the data change requests with request sequence numbers, and the dynamics manager is responsive to the request sequence numbers in determining an order for making data changes specified by the data change requests.

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1　4.　The local network-capable device in accordance with claim 3, wherein the data
2　　change request priority scheme includes encoding the data change requests
3　　with an identifier corresponding to a characteristic of the network-capable device
4　　that generated the request, and the dynamics manager is responsive to the
5　　identifier in causing making of data changes.

1　5.　The local network-capable device in accordance with claim 4, wherein each
2　　network capable device and a user thereof corresponds to an endpoint, and the
3　　identifier comprises an endpoint number corresponding to the endpoint that
　　　originated the data change request.

1　6.　The local network-capable device in accordance with claim 5, wherein the
2　　request sequence numbers comprise endpoint relative sequence numbers, and
3　　the dynamics manager causes the data change requests to be processed in an
4　　order dependent on the endpoint relative sequence numbers and the endpoint
5　　numbers.

1　　The local network-capable device in accordance with claim 3, wherein the data
2　　change request priority scheme includes encoding the data change requests
3　　with a dependency identifier, and the dynamics manager is responsive to the
　　　dependency identifier in causing rolling-back and remaking of data changes.

1　8.　The local network-capable device in accordance with claim 7, wherein the
2　　dependency identifier specifies a data change request on which the encoded
3　　data change request depends.

　9.　The local network-capable device in accordance with claim 8, wherein the
2　　dependency identifier specifies one data change request on which encoded data
3　　change request depends.

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1   10.   The local network-capable device in accordance with claim 8, wherein the

2   dynamics manager executes do, undo and redo operations with respect to data

3   change requests to ensure that each one of the data change requests is

4   processed only after the specified data change request on which the one data

5   change request depends has been processed.

     11.   The local network-capable device in accordance with claim 8, wherein

2   A)   the request sequence numbers comprise endpoint relative sequence

3   numbers;

4   B)   the dynamics manager causes the data change requests to be processed

5   in an order dependent on the endpoint relative sequence numbers and

6   the endpoint numbers; and

            C)   the dynamics manager causes data changes to be rolled back and

                   remade responsive to the dependency identifier.

     12.   A distributed, coordinated system for maintaining plural copies of data pursuant

            to a distributed data model, wherein the copies can be changed responsive to

            users' actions, the system comprising:

            A)   a plurality of computer systems, each of the computer systems capable of

                   locally generating a plurality of data change requests for changing a local

                   copy of the data and of executing data change requests including the

7   locally-generated data change requests and remotely-generated data

8   change requests generated by others of the computer systems so as to

9   make the requested changes to the local copy of the data;

10   B)   each of the computer systems including a dynamics manager for

11   determining, responsive to information contained in the data change

12   requests, an order in which the requested changes are made to the local

13   copy.

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1   13. The system in accordance with claim 12, wherein the dynamics manager of each

2   computer system is responsive to data dependency information and request

3   sequence information recorded in the data change requests in determining the

4   order in which the requested changes are made to the local copy of the data; the

5   data dependency information comprising an indication of at least one prior data

6   change request on which the data change request depends; and the request

7   sequence information indicating a sequential position of the data change request

8   among a plurality of data change requests generated by the computer system

9   that generated the data change request.

14. A framework apparatus for providing communication services for an activity-

        based collaboration system in which data change requests comprising deltas are

        communicated over a network between network-capable devices, the framework

        apparatus comprising a communications manager operable on a local network

        capable device for sending locally-generated deltas over a network to at least

        one remote network-capable devices and for receiving remotely-generated

        deltas from the at least one remote network-capable device; and a dynamics

        manager responsive to dependency information contained in the deltas for

        determining an order for processing the deltas.

15. A method for providing communication services for an activity-based

2   collaboration system, in which data change requests comprising deltas are

3   communicated over a network between network-capable devices, the method

4   comprising the steps of:

5   A)   sending locally-generated deltas from a local network-capable device over

6   a network to at least one remote network-capable devices and for

7   receiving remotely-generated deltas from the at least one remote network-

8   capable device;

9   B)   determining an order for processing the deltas based on sequence

10   information contained within the deltas; and

| 11 | C) | processing the deltas in the determined order thereby making changes to |
| 12 | | data as requested by the deltas. |

1	16.	The method in accordance with claim 15, further comprising the step of rolling
2		back changes made to the data in response to dependency information
3		contained within the deltas.

1	17.	A computer data signal embodied in a carrier wave, comprising:
2	A)	a payload code comprising a data change request code for requesting an
3		identified data change comprising a first data change request, and a
4		command code for specifying at least one command for implementing the
5		first data change request; and
6	B)	a header code comprising dependency collision resolution code.

	18.	The computer data signal in accordance with claim 17, wherein the dependency
		collision resolution code comprises a recorded indication of telespace
		membership sponsorship for use in resolving dependency collisions between the
		data change request and a second data change request on the basis of, at least
		in part, telespace membership sponsorship.

1	19.	The computer data signal in accordance with claim 17, wherein the dependency
2		collision resolution code comprises a recorded indication of characteristics of an
3		endpoint that originated the data change request for use in resolving
4		dependency collisions between the data change request and a second data
5		change request on the basis of, at least in part, the recorded indication of
6		endpoint characteristics.

1	20.	The computer data signal in accordance with claim 17, wherein the dependency
2		collision resolution code comprises a recorded indication of a type of data
3		change for use in resolving dependency collisions between the data change

4   request and a second data change request on the basis of, at least in part, the

5   data change type.

1   21. The computer data signal in accordance with claim 17, wherein the dependency

2   collision resolution code comprises a recorded indication of type of activity for

3   use in resolving dependency collisions between the data change request and a

4   second data change request on the basis of, at least in part, the activity type.

1   22. The computer data signal in accordance with claim 17, wherein the header

2   comprises a portion substantially in the form:

3   Seq.No.AA@EP.No.BB:Seq.No.CC@EP.No.DD.

1   23. The computer data signal in accordance with claim 17, wherein the dependency

2   collision resolution code comprises an identification code for identifying data to

3   which the data change request pertains, and a consistency data code for

4   identifying an endpoint and a data change request sequence number for the first

5   data change request, and for identifying an endpoint and a data change request

6   sequence number for a second data change request on which the first data

7   change request depends.

1   24. The computer data signal in accordance with claim 23, wherein the consistency

2   data code identifies the endpoint and the data change request sequence number

3   for the first data change request, and identifies an endpoint and a data change

4   request sequence number for only one data change request on which the first

5   data change request depends, said one data change request being the second

6   data change request.

1   25. A distributed, activity-based collaboration system comprising:

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A)   a data change request priority logic for determining an order of execution of data change requests for effecting changes to a local copy of data for collaborative activities; and

B)   a dependency collision resolution logic for resolving a dependency collision between first and second data change requests which both depend for execution on a third data change request.

26.   The system in accordance with claim 25, wherein the data change request priority logic and the dependency collision resolution logic are responsive to sequence number information and dependency information recorded in the data change requests for controlling computer-implemented operations including making, unmaking and remaking of changes to the data during execution of the data change requests.

27.   A distributed method for assigning designations to endpoints for use in a peer-to-peer collaboration system, the method comprising the steps of: assigning a unique designation to each endpoint of each of a plurality of members of a telespace, each designation of a member indicative of the order in which the member joined the telespace, and, for each member invited to join by another telespace member comprising the inviting member, indicative of the inviting member, and storing the assigned designation.

28.   The method in accordance with claim 27, wherein a plurality of the designations of different endpoints each indicate a chain of inviting members.

29.   The method in accordance with claim 27, wherein the designations comprise a number of orders, including a first order designating a founding member of the telespace, and at least a second order designating a member invited to join the telespace by the founding member.

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30. The method in accordance with claim 27, wherein the assigning step comprises the steps of:

    A)   upon creation of the telespace, an endpoint corresponding to a founding telespace member assigning itself a unique designation comprising a first order digit; and

    B)   subsequent to creation of the telespace, assigning, by the founding member, each of a plurality of endpoints corresponding to a new member of the telespace invited into the telespace by the founding member a unique designation comprising the first order digit of the founding telespace member, and a second order digit, the second order digits of the designations of endpoints of the new members being in a sequential order indicating the order in which the new members joined the telespace.

31. The method in accordance with claim 27, wherein the assigning step includes each of the inviting members assigning a unique designation to each new telespace member that the inviting endpoint invites into the telespace.

32. A distributed method for assigning designations to endpoints for use in a peer-to-peer collaboration system, the method comprising the step of: each inviting member of a telespace assigning a unique designation to each endpoint of each new telespace member that the inviting member subsequently invites into the telespace; and guarantying, for a plurality of telespace members that the inviting member invites into the telespace, that each designation of a member is unique within the telespace.

33. The method in accordance with claim 32, wherein the guarantying step includes guarantying, for a plurality of telespace members that the inviting member invites

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3   into the telespace, that each designation of a member is unique within the

4   collaboration system.

1   34.   The method in accordance with claim 32, wherein the assigning step includes

2   using a pseudo-random number generator for assigning the designations.